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ABSTRACT

Developed with the assistance of classroom teachers, the lesson plans presented in this guide are intended to provide secondary teachers with examples of ways that students can use thinking and technology skills to solve problems and address issues they will be facing in their own futures. Each lesson has been based on the Williams Model for Cognitive-Affective Interaction to help teachers effectively set up and conduct classroom educational experiences. The lessons are designed to fit into existing courses in language arts (10 lessons), science education (9 lessons), and social studies (5 lessons). Each plan lists the curriculum area, grade level, objectives, and activity of the lesson, as well as a brief introduction to the concepts involved. The appendices contain a description of the Williams Model for Cognitive-Affective Interaction and a discussion of databases and their uses. (16 references) (DB)

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THINKING THROUGH TECHNOLOGIES

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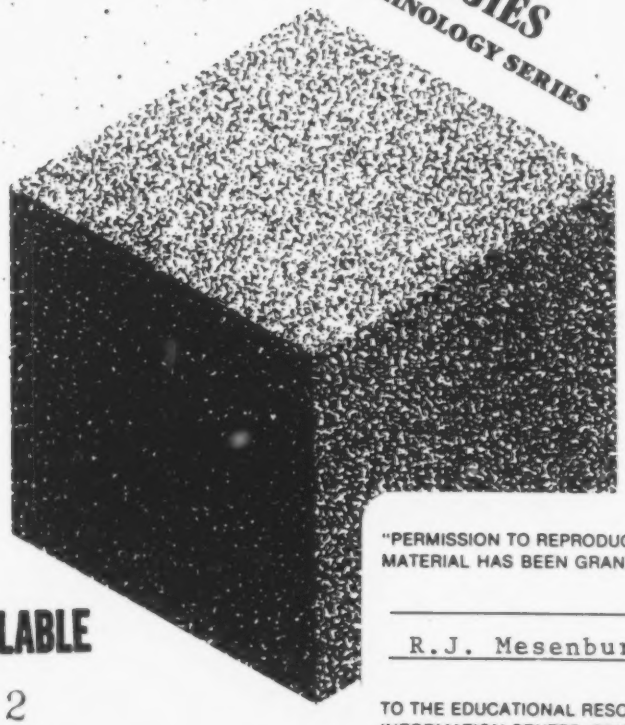

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MINNESOTA DEPARTMENT OF EDUCATION INSTRUCTIONAL DESIGN SECTION

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THINKING THROUGH TECHNOLOGIES

INTEGRATING TECHNOLOGY SERIES

Minnesota Department of Education

Instructional Design Section

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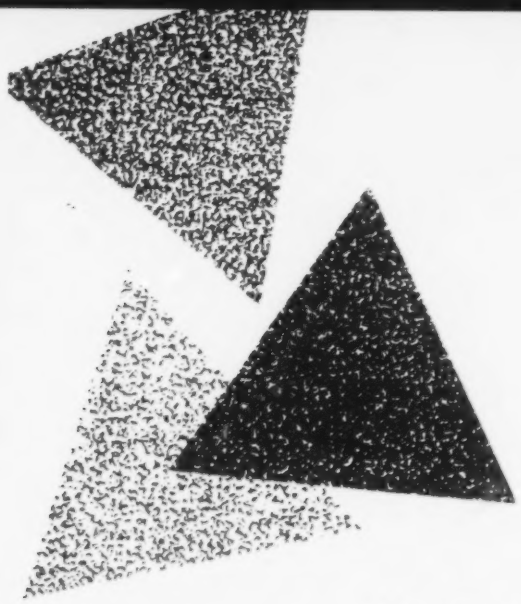
INTRODUCTION

One of the most significant challenges to educators is helping students develop an orientation to the future that is visionary, positive, and that makes them aware they will need to master technology and thinking skills they can use throughout their lives. Students need to understand that information is infinite and that their lives can be made richer and more productive when they have mastered technology skills that help them access diverse information resources. Educators need to help students feel more comfortable in using technology to multiply the power of their own thinking.

However, learning to use technology is only a starting point. A far more challenging task is helping students use technology skills and equipment to solve real problems and address pressing needs. Students, also, need to develop thinking skills and strategies that make them more efficient and more creative. The lessons in this document, developed with the assistance of classroom teachers, are intended to provide secondary teachers with examples of ways that students can use thinking and technology skills to solve problems and address issues they will be facing in their own future. Each lesson has been tied to the Williams Model for Cognitive-Affective Interaction (see Appendix A) to help teachers effectively set up and conduct classroom educational experiences. Given the already overcrowded curriculum, teachers do not need new subjects to teach. For this reason, the lessons are designed to fit into existing courses and to address learner outcomes teachers would ordinarily cover in those courses. In short, the activities in this document are intended to help students be effective lifelong learners by developing and practicing thinking strategies while using technology tools that make them more efficient.



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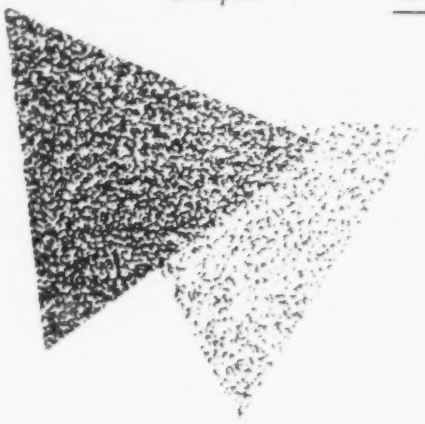


LESSON PLANS

- Most Admired Person Poll
- Making Historical Fiction Live
- Heroes and Heroines in the Modern Day
- Author Timeline
- Our Community: Then and Now
- Collaborative Writing
- Find the Theme
- What's So Funny?
- Media Literacy
- Science Fiction

MOST ADMIRED PERSON POLL LESSON PLAN

CURRICULUM AREA Language Arts

GRADE LEVEL(S) Grades 5-8

INTRODUCTION What are some qualities about people that we all tend to admire? How can traits we admire in one person be traits we dislike in another? *Williams' Strategies: attributes; paradoxes. See Appendix A.*

OBJECTIVE Using a committee-based work structure, students will design and conduct a poll of their classmates to determine the ten adults they most admire, and then research these to provide a biographical sketch for inclusion in a published report of their findings.

ACTIVITY Students will divide into groups according to their interests so that each of the following committees may be adequately staffed:

Public Relations Committee—responsible for letting the student body know that a poll will be conducted and that they should be thinking about candidates; also responsible for negotiating an appropriate method for publishing the final results. These are the students who will be putting up posters, writings ads for the school newspaper, contacting the local paper about publishing the poll results, etc.

Data Collection Committee—responsible for devising a questionnaire to be given to members of the student body which will provide the type of data needed for the poll. These students will need to write the questionnaire, have it duplicated, decide where and when it is to be distributed and collected, etc.

Evaluation Committee—responsible for compiling the results of the questionnaire and presenting accurate data to the Research Committee. These students must organize the raw data in a manner that enables them to determine the ten winners and report any other significant data requested by the Data Collection Committee or the Executive Committee.

Research Committee—responsible for researching the ten most-admired individuals and preparing a written biography of each to be used by the Public Relations Committee in its final reporting. These students should be familiar with the reference materials in the media center, especially the *Video Encyclopedia of the 20th Century* (see References), and be able to produce well-edited reports using the word processor.

Executive Committee—responsible for coordination of all the committees and for the project as a whole; composed of an elected chairperson from each of the above committees, and the teacher. These students, with the teacher's guidance, are responsible for the overall planning and outcome of the project.

CLOSURE

What are some of the ways these people could misuse their admired qualities to their own advantage? What are some additional traits that might be helpful for these people to have? *Williams' Strategies: adjustment to development; attributes. See Appendix A.*

SPECIAL NOTE

Students need to know how to use the *CD/ROM Grolier's Electronic Encyclopedia* (see References), the *Video Encyclopedia* and other biographical reference materials as well as a word processor. The software programs "Timeliner" and "Dazzle Draw" (see References) can be used to complete this activity.

MAKING HISTORICAL FICTION LIVE LESSON PLAN

CURRICULUM AREA Language Arts/Literature

GRADE LEVEL(S) Grades 7-9

INTRODUCTION How is historical fiction like a map? How might we find out more about occupations throughout history? What recommendations would you make to the characters in the story? *Williams' Strategies: analogies; discrepancies; organized random search. See Appendix A.*

OBJECTIVE(S) Students will reconstruct the time period in which a work of historical fiction is set in order to assess the occupations, costumes, homes, entertainment, finances, and government of that period.

Students will be divided into groups. They will brainstorm a list of questions they might like to ask the author or main character. They will classify the questions into categories which might include the following: occupations, costumes, homes, entertainment, finances, etc. They will then choose one of these topics to research and report on. Students will use media center resource materials and will work cooperatively in groups. Familiarity with "Timeliner " and "Dazzle Draw" software programs may be useful. The students in each group will make a presentation to the class of the information they have found and its relationship to the novel studied. They may choose to use visuals or technology in their presentations.

CLOSURE Which categories, homes, costumes, occupations, etc., might you like to see illustrated in the novel? How would it add to the understanding of the plot? *Williams' Strategies: provocative questions; evaluative situations. See Appendix A.*

SPECIAL NOTES Students will need to know how to use the resource materials of the media center and be able to work cooperatively in groups. "Timeliner" and "Dazzle Draw" are software programs which may be useful in completing this activity.

HEROES AND HEROINES IN THE MODERN DAY LESSON PLAN

CURRICULUM AREA Language Arts/Literature

GRADE LEVEL(S) Grades 7-12

INTRODUCTION What are some of the essential or most important attributes of heroes/heroines? How can those same attributes limit the actions of leaders and role models? What are some of the things we don't know about heroes/heroines? *Williams' Strategies: attributes; paradoxes; discrepancies. See Appendix A.*

OBJECTIVE Students will select and do biographical research on a contemporary hero/heroine in order to understand the process of biographical writing and to evaluate society's criteria for hero/heroine selection. They will create and present a visual and oral sketch of their hero/heroine to the class.

ACTIVITY Students will select a person they admire who is currently enjoying hero/heroine status. Students should consider selections from many areas, including sports, music, government, business and industry, arts and literature, entertainment, religion, science and medicine, and education. When the subject has been chosen, students are to research that person's life using as many sources as possible, both media center reference materials and current periodicals. After completing the research, students are to write a biographical sketch and evaluation following this outline:

I. Facts about the hero's or heroine's life.

II. Explanation of what has made this person famous.

III. Examination of the value of this person's contributions to society.

IV. Personal opinion: Does the person deserve to be called a hero or heroine?

Students will compose a collage showing characteristics of their chosen hero/heroine—either a video collage using the *Video Encyclopedia of the 20th Century,* and student-produced video footage dramatization of character, person-on-the-street interviews, etc., or a paper collage using magazine and newspaper headlines and pictures. The written assignment may be done on a word processor and printed out.

Students will make a brief presentation to the class about their hero/heroine during which they present a few facts about the person and show the video or paper collage. (All sketches and collages should be displayed around the room and some time given over the next few days so that they can be read.)

CLOSURE

From what we've learned about heroes and heroines, what characteristics do you predict these types of persons will have a century from now? What would happen if we had no heroes/heroines? *Williams' Strategies: evaluative situations; tolerance for ambiguity. See Appendix A.*

Students will conduct a follow-up evaluation of all the heroes/heroines studied to select the one that they feel best embodies the characteristics of a modern American or world hero/heroine and send a citation to him or her from the class. A link could be established with the art/photo classes using "Dazzle Draw" or photographic slides to create a slide show to be used in conjunction with the oral presentation.

AUTHOR TIMELINE LESSON PLAN

CURRICULUM AREA Language Arts/Literature

GRADE LEVEL(S) Grades 7-12

INTRODUCTION What are common milestones in a person's life? What things could you determine about the time period in which a person lived by those milestones? *Williams' Strategies: examples of habit; organized random search. See Appendix A.*

OBJECTIVE Students will be able to distinguish a time frame for the authors and works in a unit of literature by developing a timeline based on the authors' lives and significant historical events.

ACTIVITY On a large sheet of paper, students will list the authors in the particular unit being studied. They will divide into groups and choose an author from the list. Using the *Electronic Encyclopedia* or other reference materials, they will determine the years of birth and death for each of the selected authors. (If a date can be found for the particular work being studied, that should also be noted.) When all the dates have been determined, the timeline should be made by using the "Timeliner" computer program or by drawing it on a large piece of paper. The starting year and ending year should be determined by the class. They may be the earliest and latest dates, the beginning/ending of a century, or significant historical dates. Increments must also be decided upon and marked on the timeline. Students may then begin marking the lifespan of the authors on the timeline using a different color marker for each. Using the *Video Encyclopedia of the 20th Century* when possible and other reference materials, students should determine the important historical events which occurred during this time span. These should also be added to the timeline. The completed timeline should be hung in the front of the classroom for easy reference throughout the course of the unit to help determine which authors were contemporaries, which may have been influential on others, what role historical events played in the works, etc.

CLOSURE

Suppose you were given the power to adjust the timeline of the author's life. How would you use this power? How would you feel if your life matched the timeline of the author's life? *Williams' Strategies: tolerance for ambiguity; intuitive expression. See Appendix A.*

SPECIAL NOTE

Materials needed are the "Timeliner" computer program (see References), or a large roll of paper, markers, and a ruler. Students will need a working knowledge of CD-ROM/*Grolier's Electronic Encyclopedia* and the *Video Encyclopedia of the 20th Century.*

OUR COMMUNITY: THEN AND NOW LESSON PLAN

CURRICULUM AREA Language Arts/Writing

GRADE LEVEL(S) Grades 7-12

INTRODUCTION How do the needs and desires of people lead to communities? What are some qualities of communities which make them necessary? *Williams' Strategies: provocative questions; attributes. See Appendix A.*

OBJECTIVE Students will be able to analyze photographs of their community from different time perspectives to identify and evaluate the changes that have occurred and will be able to write comparison and contrast essays.

ACTIVITY The students will view a slide of a community site, street, or landmark as photographed quite some time in the past. Students will describe what they see in the photo while their responses are recorded on the blackboard, an overhead projector, or a large sheet of paper. Once this old photo has been discussed, students will view a slide of the same site as it looks today. The same describing and recording procedure will be used for this photo. The two lists will then be placed next to each other and visible to all students so that they can find things that are alike on both lists. Once the similarities have been identified, students will focus their discussion on the constants in the life of the community. The remaining items on the two lists most likely will point out changes that have occurred because of the passage of time. The discussion of these items will focus on changes such as transportation, technology, use of land, etc. Students will consider how these changes have affected their community and the people living in it. Students will find an old photograph of some site in the community (possibly from the public library) and will take a present photograph of the same site. Once the two photos are available to the student, a description listing will be made for each photo so that the comparison/contrast exercise can be undertaken.

The students will then write an essay based on the two photos using the following outline:

I. Description of old site.

II. Description of present site.

III. Examination of how the two sites are alike (comparison).

IV. Examination of how the two sites differ (contrast).

V. Evaluation of the changes time has brought.

CLOSURE

In what ways are communities changing every day? How could we get a community to accept the idea of something that may need to be changed? *Williams' Strategies: examples of change; examples of habit. See Appendix A.*

SPECIAL NOTES

If still photos were used, the students may choose to mount their two photos and their essay on a piece of colored tag board so that a classroom display can be created. Such a display could also be shown in the public library, the county museum or courthouse, or some other public area. If video photos were used, a compiled video film could be made by first showing the old photo while the student identifies the place and date and then showing the present-day footage while the student reads the evaluation paragraph from his or her essay. Such a film could be used by social studies classes in the school district or could be made available to community groups.

COLLABORATIVE WRITING LESSON PLAN

CURRICULUM AREA Language Arts/Writing

GRADE LEVEL(S) Grades 7-12

INTRODUCTION What do we do better when two people work together instead of one? Describe a story from the viewpoint of an experienced writer. *Williams' Strategies: adjustment to development; attributes. See Appendix A.*

OBJECTIVE Students will create a story in collaboration with a partner and evaluate the collaborative experience and product.

ACTIVITY Students will read and discuss the news article about the novel *Killing Time* in St. Cloud written in collaboration by Minnesota authors Judith Guest and Rebecca Hill ("Teamwork: Nationally Known Authors Combine on Novel," appeared in the Brainerd, MN Daily Dispatch on June 29, 1987) or some other article or review which deals with joint authorship may also be used. Students will work as partners at a word processor. A story starter opening line will be used by all the groups as the basis for writing a short story. Students will be allowed only one or two class periods to complete the story, since the process, not the product, is the main issue. During their work time, students will have to determine with their partners the most efficient method for conceiving the story and getting it into written form. They should be encouraged to make notes about the process as they are working. At the end of the writing time, the stories will be printed and turned in to the teacher. The following class period will be spent in discussion and evaluation of the collaborative process. Students will brainstorm a list of questions which may be used as a questionnaire or as a basis for evaluation. The printed stories will be returned to the students so that they may read and assess the quality of the story in a written evaluation.

CLOSURE How did working as partners affect the story you produced? If Shakespeare could rewrite your story, how would it improve? *Williams' Strategies: evaluative situations; provocative questions. See Appendix A.*

FIND THE THEME
LESSON PLAN

CURRICULUM AREA Language Arts

GRADE LEVEL(S) Grades 9-12

INTRODUCTION What are some attributes of a theme? In what ways has the development of music videos changed the music industry? *Williams' Strategies: attributes; adjustment to development. See Appendix A.*

OBJECTIVE Students will create a new production by matching song lyrics to video clips. They will then explain how their lyric's theme and music manipulate the visual message into meaning.

NECESSARY MATERIALS The *Video Encyclopedia of the 20th Century*, recordings or reprints of song lyrics. Clips used in this activity should be pre-selected from the *Video Encyclopedia* and then edited together onto one tape.

ACTIVITY Students will prepare for this activity by collecting song lyrics from current or past popular songs. Students will be expected to match these songs with video clips that illustrate similar themes or moods so that they are able to use some discrimination when choosing their song lyrics. Each person should be responsible for bringing to class at least one transcription. Students should also be encouraged to bring the actual recording. After viewing a selected clip students will be asked, "What is this scene about?" "How does it make you feel?" "What ideas is it about?" "Can you think of a song you know that would reinforce these feelings or ideas?"

Example: Students will view a clip of young soldiers in Vietnam and discuss its themes and mood. They will then listen to a pop hit such as "19" or any other anti-war song with the clip and discuss it again. Then they may view the clip while listening to "The Star Spangled Banner" by Jimi Hendrix or "In America" by The Charlie Daniels Band. "How does the music change the meaning?"
(This should lead to a discussion of media manipulation and propaganda techniques in addition to a discussion about theme

and mood.) The students will divide into groups to determine roles, producer, director, screenwriter, etc. Using the class activity above as a model, each group will choose a video clip from the prepared tape from the *Video Encyclopedia* and match it with an appropriate lyric that echoes, manipulates, or creates a theme or mood. After presenting their new production to the class, each group should provide a written or oral explanation for their pairing.

CLOSURE

How can a theme be sad yet beautiful? How are the steps in creating a music video like the steps in creating a 17th century painting? *Williams' Strategies: paradox; study of creative people and processes. See Appendix A.*

SPECIAL NOTES

A discussion of universal themes and motifs in homekind's productions, including songs, poems, movies, reports of events, stories. Students may choose to use the *Video Encyclopedia*, and recordings or reprints of song lyrics. Clips used in this activity could be preselected from the *Video Encyclopedia* and then edited together onto one tape.

WHAT'S SO FUNNY? LESSON PLAN

CURRICULUM AREA Language Arts/Literature

GRADE LEVEL(S) Grades 9-12

INTRODUCTION How can you explain humor by comparing it to medicine? Suppose that we did not have humor—what would be the results? *Williams' Strategies: analogies; tolerance for ambiguity. See Appendix A.*

OBJECTIVE Students will design a video and print scrapbook which will illustrate some classic techniques of comedy.

ACTIVITY Students will discuss humor in an attempt to find a definition of comedy which will satisfy the class. Students may wish to view a short clip of the *Keystone Cops* or some other cartoon in order to find examples for discussion. They may wish to discuss how in a comedy the characters undergo embarrassments or misfortunes which are managed so that they interest us and entertain us without causing our sympathy to be aroused. With the use of examples—either from comic strips or a prepared video sequence or both—the students will brainstorm a list of common comedic stereotypes: teenagers, children, etc. The students will also discuss some common situations or subject matter: Generation Gap, underdog embarrassing establishment, cafeteria food, messy cooks, battle of the sexes, etc. Students will then be assigned to come to class with examples of some of these stereotypes and situations from newspapers or magazines. They will also tape parts of comedies from television and show these to the class. Students will examine a teacher-generated list called "Techniques of Humor." (Some of the terms defined and illustrated would be: exaggeration, understatement, ridiculous or obvious statement, anachronism, satire, irony, sarcasm, slapstick, word play, dialect, funny names, etc.)

CLOSURE In groups of two or three, the students will use the list as a guide and find examples of as many of these techniques of humor as possible. They may also view some comic clips and analyze them for these techniques. Students will then design their own humor scrapbook which contains both print and video examples of a particular stereotype, situation or technique and present it to the class in a week's time.

In what ways has technology changed humor or comedy? What special skills or traits might be helpful to a comedy writer? *Williams' Strategies: examples of change; study of creative people or processes. See Appendix A.*

SPECIAL NOTES

Students may need the *Video Encyclopedia of the 20th Century*, humor pages from magazines and newspapers, VCR and cassette tape. The teacher may wish to prepare a tape from the *Video Encyclopedia* with a series of clips illustrating the comic techniques she or he wishes to emphasize in class. He or she should also have print examples to show the class.

MEDIA LITERACY LESSON PLAN

CURRICULUM AREA Language Arts

GRADE LEVEL(S) Grades 10-12

INTRODUCTION How is a book like a movie? In what ways have movies changed our appreciation for literature in books? *Williams' Strategies: analogies; examples of change. See Appendix A.*

OBJECTIVE Students will make a "movie" of a book they have read by creating a storyboard which visually and audibly illustrates the setting, point of view, theme, characters, and tone. As much as is practically possible should be videotaped.

ACTIVITY After reading a book, students will divide into groups and will select roles — producer, director, screenwriter, art designer, composer, etc. Students will design title and credit graphics which accurately reflect the tone of the selected work. (Lettering styles will have to be discussed.) Students will compile a series of clips of actors from the *Video Encyclopedia of the 20th Century* (i.e., reference #0006 shows a series of Hollywood stars of the 20s) who could play the characters in their book. They may choose to do this same activity in writing, accompanying it with still photos and a short justification for the character/actor matches being made. Students will choose a scene from the *Video Encyclopedia* which could run behind the credits and accurately set the scene for the movie. Students may choose to produce their own scene using the video equipment in the studio, or they may describe in writing the setting, camera angles, facial expressions, etc., which they would produce if they had the facilities (and budget) of a major filmmaker. The opening credits of Hitchcock's *Rear Window* are an excellent model for students. Students will design a shot list of their entire film. Examples of these are contained in the reference volumes of the *Video Encyclopedia*. The teacher can use these selected clips or those from any film or video to provide practice in writing shot lists. Students will rewrite the denouement of their book in play form.

CLOSURE

They will also select the "theme song" of the movie and discuss their choice. How do the lyrics reinforce or reflect the book's theme? How does the use of film lead to something positive in the area of literature? *Williams' Strategies: provocative question; adjustment to development. See Appendix A.*

SPECIAL NOTES

Students will need video equipment, the *Video Encyclopedia*, selected movies, art materials, costumes, magazines. Students should have the technical background to operate video equipment independently. They should also have some background in the process of film making. "Dazzle Draw" (for illustrations), "The Publisher," (see References) or other desktop publishing programs would be useful for this activity.

SCIENCE FICTION

CURRICULUM AREA Language Arts/Literature

GRADE LEVEL(S) Grades 11-12

INTRODUCTION Describe all the ways in which you would know a piece of literature was science fiction. How would science fiction look or feel to Joan of Arc? *Williams' Strategies: attributes; visualization skill. See Appendix A.*

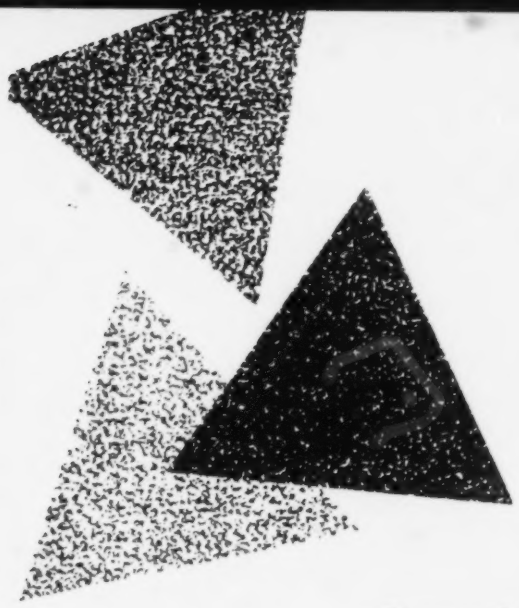
OBJECTIVES Students will improve reading, writing and research skills and will analyze issues in an atmosphere encouraging exploration and imagination.

ACTIVITY Students will view a value situation from the *Video Encyclopedia of the 20th Century* (atomic war, destruction of the world, after the Holocaust) that will reflect some important values.

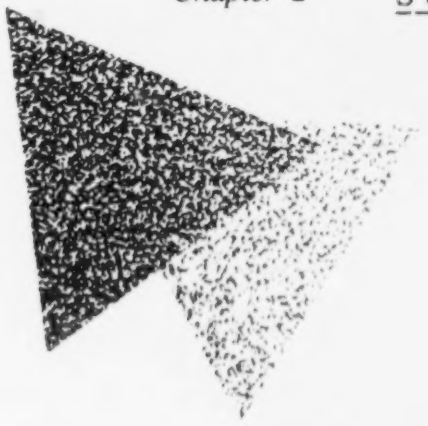
Students will read three related novels: *1984; The Martian Chronicles; Alas Babylon.* After reading the three books, students will divide into three working groups to a) list as many values as possible contained in the book, and b) select from the list a consensus of the most important values. Students will tape and play back to the class portions of the book establishing the most important society values. (Role playing and videotape may be used.) The students will write a response, criticism, argument, or defense of the position.

CLOSURE What could happen in the future if a particular value is pursued? Take a survey about values suggested in the three science fiction novels listed above and share your results. How would you feel if you were a hero/heroine in a science fiction story? *Williams' Strategies: evaluative situations; organized random search; intuitive expression. See Appendix A.*

SPECIAL NOTES Students will need to have a working knowledge of the *Video Encyclopedia* as well as videotaping equipment.



Chapter 2 SCIENCE



LESSON PLANS

- Stream Flow
- Planning a Shelterbelt
- pH of Rain
- Model Rocketry
- Fossils
- Accuracy of Weather Forecasting
- Patterns in Nature
- Friction
- Topographic Map

STREAM FLOW LESSON PLAN

CURRICULUM AREA Earth Science

GRADE LEVEL(S) Grades 7-12

INTRODUCTION How is a stream like a child? How might we collect data about a stream? (Williams' Strategies: analogies; skills of search.)

OBJECTIVE Students will determine the average velocity of surface water at various sites across the width of a stream in order to better understand the physical dynamics of stream flow.

ACTIVITY Students will study science in an appropriate setting—outdoors in a natural environment. After selecting the study site(s), the students will divide into small data-gathering groups. Each group will have a set of equipment: metric tape, stakes and hammer, notepad/pencil, stopwatch, a two-meter length of string that is attached to a styrofoam ball and waders if needed. Groups will stake in and stretch their meter tape across the width of the stream. Students will decide upon an interval for velocity measurement. For example, if the stream is 18 meters across, students might check velocity every two meters. Students will use the following procedure at each place where flow is measured:

1. Set the stopwatch; drop the ball on the end of the string into the water. Be sure the ball is as far away from your body as possible because stream flow is affected by where one stands in the water. Be sure the hand holding the string is as close as possible to the surface of the water.

2. At the moment the ball hits the water, start the stopwatch.

3. As soon as the string becomes taut, stop the watch. Record this time on the notepad.

4. Repeat the process two more times for each spot in the stream and average your results.

5. Convert flow rate into meters per second for each interval.

Back in the classrom, students will construct a profile (cross-section) of the stream's velocity for the entire width of the stream. Students will choose a product (discussion, report, diagram, etc.) to respond to the following questions:

1. Is stream flow constant across the entire width of the stream? What factors affect this?

2. Is stream flow constant vertically from bottom to top? Is the fastest flowing water to be found near the surface? What factors affect this?

3. Does stream flow change during the year/seasons?

4. Does stream flow affect channel shape and size?

5. Does stream flow affect what sediments are on the river bottom?

(Data collected in this lesson can be graphed using the microcomputer software "Visualizer IIE" (see References). or another graphing program.)

CLOSURE How can streams be altered? What recommendations can you make to people who control aquatic life in streams? *Williams Strategies: provocative question; organized random search. See Appendix A.*

PLANNING A SHELTERBELT LESSON PLAN

CURRICULUM AREA Ecology

GRADE LEVEL(S) Grades 7-12

INTRODUCTION What questions might we ask a naturalist to find out about a shelterbelt? What might the effects on wildlife be if civilization had never happened? *Williams' Strategies: discrepancies; examples of change. See Appendix A.*

OBJECTIVE Students will evaluate a particular tract of land in order to promote modern concepts of wildlife and soil conservation.

Students select an area for which they will plan a shelterbelt. Areas must be at least one acre or more in size and can include anything from city parks to farmsteads. (If students select a fairly large tract where multiple shelterbelts could be planted, the activity could become a cooperative group project.) First step is to videotape, if possible, the parcel of land they have selected. An aerial view would be especially helpful. This tape will be used as a reference for the second activity—drawing a rough sketch map of this area for the shelterbelt. A computer graphics program such as "Dazzle Draw" would be beneficial as errors can easily be corrected. This should include roads, buildings, landforms (hills, swamps, wooded areas, etc...) and approximate distances with compass direction.

After discussing initial plans with the instructor, students can "fine tune" their map, and plan for rows of trees and shrubs, numbers and types needed, along with proper placement. This design should meet all effectiveness factors for shelterbelts. Students need to include a map key plus inventory the total number (and type) of plants necessary. This can include the actual cost for purchasing the trees/shrubs. On the back of the plan, the students will list as many beneficial reasons as possible for its implemention.

CLOSURE In what ways does a shelterbelt slow change? What would happen if humankind never replaced what we destroy? *Williams' Strategies: examples of habit; tolerance for ambiguity. See Appendix A.*

VARIATION

This activity could develop into a community service project if the plan is for a tract of land owned by the public. Students could present the plan to the appropriate unit of government such as the County Board for implementation and/or engage in a fund raising effort for purchase of the plants. Planting the shelterbelt and maintaining it could become a long-range activity involving many different classes of students.

SPECIAL NOTE

The Minnesota Department of Natural Resources has published an excellent free booklet *Woody Cover Plantings for Wildlife* that can serve as a main reference source (see References).

Outside resources such as wildlife managers and forestry personnel could also be brought in as speakers to the class and aid in the project.

pH OF RAIN
LESSON PLAN

CURRICULUM AREA Science/Acid Rain

GRADE LEVEL(S) 7-12

INTRODUCTION How can a forest give us ideas for working on the problem of acid rain? Describe acid rain from the viewpoint of an animal. *Williams' Strategies: analogies; attributes. See Appendix A.*

OBJECTIVE Students will test for pH levels in rainfall, lakes/ponds, and ground water of their local area. They will tabulate results and prepare a chart of their findings

.

SPECIAL NOTES Explain/discuss the pH scale and the basics of acid rain. Obtain short mid-range pH paper, small "Zip Lock" plastic bags, and a quantity of pH color charts for paper used if available. Also needed is a map of the local area and colored pins. Teacher and/or students will determine categories for, and set up, an electronic database for information collected.

ACTIVITY Three areas of local water will be tested during this activity. It is very important not to contaminate the water being tested. The test kit consists of a piece of pH paper, color chart, and a small plastic bag.

Part I - Rainfall: Students will collect a small amount of rain directly from the air. This can be done directly into the bag or another clean container. Students will put approximately one teaspoon of rain into the bag with pH paper. The bag will be closed and students will be sure paper is completely saturated with rain water. They will compare color to chart by placing both on a white sheet of paper. On data sheet they will record date/time, pH, location, wind direction, temperature, amount and duration of rainfall, and person collecting data.

Part II - Lake and Pond Water: Students will follow procedures for rainfall but test water from lakes and ponds. In addition to data collected for rain, they will include water temperature and depth.

Part III - Ground Water: Students will follow procedures for part I and II but will test water from underground water sources. City and private wells, springs and irrigation sources can be tested. Data will also include depth of well. As data is collected, students will compile all information in an electronic database in their laboratory (classroom). A map will be marked with pins to show location of test and number to refer to data chart. Red pin = rain/snow test, blue pin = lake/pond test and white pin = ground water/well test.
Students will compare data with prior tests in that location and note change. Normal rainwater has a pH of 5.6.
Students will study all the data collected and begin their analysis by answering the following questions:

1. How does rainfall in your test area compare with the pH of normal rain of 5.6? Can you think of a reason? (Remember wind direction, date, and other data.)

2. How does pond/lake water pH compare to rainfall? Other lakes? Why? Remember factors that could include depth of water, time of year/season, vegetation, and geology of the area.

3. How does ground water compare to rain and surface water? Does depth of well affect pH in your area? Support your answer.

4. What conclusions can you make from this scientific study of local water?

CLOSURE

How many ways can you find to categorize ideas about acid rain? How will areas of acid rain look in two hundred years if we do not counteract the problem? *Williams' Strategies: organized random search; visualization skill. See Appendix A.*

SPECIAL NOTES

Explain/discuss the pH scale and the basics of acid rain. Obtain short mid-range pH paper, small "Zip Lock" plastic bags, and a quantity of pH color charts for paper used if available. Also needed is a map of the local area and colored pins. Teacher and/or students will determine categories for, and set up, an electronic database for information collected. Sources of information will be the *Video Encyclopedia of the 20th Century*, *CD ROM/Grolier's Electronic Encyclopedia*, and the Acid Rain Foundation (see References). Students should be encouraged to test water on trips to other parts of the world. Electronic mail can be used to expand data.

MODEL ROCKETRY LESSON PLAN

CURRICULUM AREA Science/Aviation

GRADE LEVEL(S) Grades 7-12

INTRODUCTION What skills are necessary to create a model rocket? A real rocket? When have failures in rocketry led to progress? *Williams' Strategies: study of creative people and processes; adjustment to development. See Appendix A.*

OBJECTIVE Students will perform tasks to construct a flying model rocket. The builder will demonstrate stability and strength of the rocket in preflight tests. Prior to flight, safety hazards will be identified and steps taken to prepare a safe launch. Data from the flight will be evaluated.

ACTIVITY Students will recall criteria for scientific investigation. They will suggest criteria for evaluation of their own work. Students will choose to design a model rocket or to build one from a kit. If a kit is chosen, they will follow the instructions for construction provided. Each rocket should have a checklist that students can use for quality control, e.g., fins checked for alignment. Once construction is complete, students will start ground tests. Students will find center of gravity for their rocket with and without dummy engine installed. They will tie string around this point and secure it with tape. Rockets will be gently swung around and observed for stability problems. Students will measure and record their choice of weather factors and determine if conditions are conducive for a launch. Safety checklist should be completed: area clear, safety key installed in launch controller, rocket engine installed, rocket on pad. Students will complete countdown, stopping if problems exist. Students will observe, collect, and chart data while rockets are in flight: flight pattern, time of flight, altitude, parachute or streamer descent, and landing distance from launch site are possible areas from which students may choose to collect data. (Altitude can be determined by positioning an observer a set distance back from the launch pad. The observer follows the flight to maximum height with a protractor/weighted string device. The altitude can then be calculated by multiplying the tangent of the angle by the distance from the launch pad.)

Students will examine the rockets after flight. In succeeding flights, students will predict flight data and compare to actual data for each flight.

CLOSURE

Students will evaluate their rockets and their experiences based on criteria previously set with guidance of teacher.

SPECIAL NOTE

Material can be obtained from local hobby stores or various model rocket companies. First time builders may want to use kits. Work area will need to be provided. Some tools and supplies may be available from the school art department.

FOSSILS
LESSON PLAN

CURRICULUM AREA Science/Fossils

GRADE LEVEL(S) Grades 7-12

INTRODUCTION How can we study fossils to predict the future? What are some qualities about fossils which make them interesting? *Williams' Strategies: paradoxes; attributes. See Appendix A.*

OBJECTIVE Students will examine and classify fossils as to their formation. They will then create and interpret modern-day fossils.

ACTIVITY Students will discuss and examine various forms and types of fossils. The following questions can begin discussion. How did these fossils form? Does everything become a fossil? What are conditions needed for fossilization to occur (hard parts and rapid burial)? When you find fossils in an area with layers of rock can you then decide which fossil is older? Students may work individually or in groups to find small objects that could become fossils from our current time. Some examples may include: broken pencils, leaves, twigs, golf tees, hair pins, money, bottle caps, and feathers.

Students will follow these directions for making fossils:

Day One/Monday/current situation: Mud flats, prepare milk carton or other container for fossil formation. Cut open one side of the carton to form a retangular, open-top box. Mix plaster of Paris, water, and a small quantity of soil for color. Pour mixture into container to depth of one centimeter. Coat a few objects with petroleum jelly and lay horizontally on the surface of the "mud."

Day Two/Tuesday/current situation: Volcanic eruption. Coat Day One's mud layer with petroleum jelly. Mix wood or charcoal ash with plaster of Paris. Pour mixture to depth of one centimeter and put new fossils in place.

Day Three/Wednesday/current situation: Rock slide. Follow previous procedures but mix pebbles with plaster of Paris.

Day Four/Thursday current situation: Covered by ocean. Follow procedures but mix sand with plaster of Paris.

Day Five/Friday/current situation: Drought and erosion occurs. Remove rock from container and exchange with another group or individual. You know nothing of the age or time of Monday, Tuesday, and Wednesday. The only clues to what life was like at that time will be the fossils found in this rock. You do not know the names or uses of the objects found. You will evaluate each object and decide what it may have been or its use. Use your imagination. Support your answer with reasons. Carefully separate the layers. As you discover fossils, number each one and record information on an electronic database. Data should include: identification number, measurements, description, and person making the discovery. Once you have completed your archaeological dig, evaluate fossils found and write a report. The report should include your interpretation of the fossils and what life may have been like during the age of Monday, Tuesday, and Wednesday.

CLOSURE

What do we do better today because of the study of fossils? Is a fossil always old? Why? *Williams' Strategies: adjustment to development; examples of habit. See Appendix A.*

SPECIAL NOTES

Tracks can be drawn on the surface of the plaster. Actual tracks can be used by making a cast of a track and pressing this into the plaster to form an impression. Students can manipulate information on the database to draw conclusions, determine patterns and find similarities and differences in fossils. Number and types of layers can be varied. Food coloring can be used to identify layers. After removing the objects one can create casts from molds. Take two adjacent layers of plaster and coat molds with petroleum jelly. Pour some plaster into mold and put layers together until it hardens. You may need to put a hole in one layer of plaster leading to the mold. Tree sap or pitch can be collected to produce amber. Amber has preserved insect fossils.

ACCURACY OF WEATHER FORECASTING LESSON PLAN

CURRICULUM AREA Science/Meterology

GRADE LEVEL(S) Grades 7-12

INTRODUCTION How would things change if we lost our ability to predict the weather? Describe weather from the viewpoint of a cloud. *Williams' Strategies: adjustment to development; attributes. See Appendix A.*

OBJECTIVE The student will record weather forecasts from local newspapers, radio, televison, and the National Weather Service. The forecasts will then be analyzed by direct observation during the forecast period. Data will be summarized to determine the accuracy of the forecasts.

ACTIVITY The students will discuss the idea of tracking weather forecasts by reviewing the following questions: Where do we get weather information? How accurate are these forecasts? What effect does weather or a weather forecast have on our lives? Brainstorm sources for weather information, including newspapers, radio, television, AM TV weather, National Weather Service continuous broadcast, flight service station, insect phenomenon, etc.). Students will record predicted weather forecasts from various sources. If desired, they may develop a form sheet to include such predicted factors as: high/low temperatures, sky cover, precipitation, wind direction, and velocity. Humidity and storms could also be included. The next day, through actual observations or current conditions from the same weather source, students will record actual weather conditions for that day. They will establish a plus/minus factor for each reading, for example: +- 2 degrees temperature, +-5 knots windspeed. Students will compare actual conditions to those forecast to obtain an accuracy percentage. They will continue classroom discussion and recording for several weeks and determine what is the best source of weather information for the area.

CLOSURE

Why are weather forecasts not 100 percent accurate? Are weather forecasts more or less accurate now than in our recorded history? Why? What ideas, details or facts would make our understanding of the weather clearer? *Williams' Strategies: adjustment to development; discrepancies. See Appendix A.*

SPECIAL NOTES

National weather services have continous broadcast services covering most of the United States. Radios are commercially available. Flight service stations are located at major airports and service is available through the telephone. Current meteorological data can be obtained from an online database.

PATTERNS IN NATURE LESSON PLAN

CURRICULUM AREA Science/Observation

GRADE LEVEL(S) Grades 7-12

INTRODUCTION How is a pattern like a newspaper? How does a pattern look when we are very, very close to it? (Williams' Strategies: analogies; visualization skill.)

OBJECTIVE Students will identify patterns found in our natural world. They will produce a copy and determine a reason, if possible, for this pattern.

ACTIVITY Students will observe their natural surroundings during their daily routine of work and play. A field trip or walk through a natural area would be a good beginning point to this activity. Students will observe all types of patterns, but will record visually and by written word any NATURAL patterns. A few examples of patterns that could be found include: frost on a window, mushroom ring, leaf veins, bark, ripple marks, mud cracks, cloud forms, ant hills, flights of birds. Mediums that could be used to record or collect the patterns include: pencil, painting, tracing, photography, rubbings, or video camera. Location, date and time should be noted on all patterns recorded. Students will choose to display their patterns by classifying them, forming them into a book, videotape, or slide show to complete the project. They may choose to describe their patterns to the class.

CLOSURE What would our world be like if there were no patterns or texture? What patterns could we use to describe different emotions? *Williams' Strategies: tolerance for ambiguity; intuitive expression. See Appendix A.*

Coordinate with school art department for art instruction, supplies and possible dual credit. The computer program "Dazzle Draw" could be used for artwork and a computer slide show.

FRICTION
LESSON PLAN

CURRICULUM AREA	Science/Force
GRADE LEVEL(S)	Grades 8-12
INTRODUCTION	Suppose vehicles had air flotation rockets instead of tires. What might change? What happens to a vehicle when the friction among its parts is decreased? *Williams' Strategies: examples of change; skills of search. See Appendix A.*
OBJECTIVE	Students will construct a vehicle, within size and weight limits, to be as frictionless as possible. The vehicles will be tested and evaluated to determine the one showing the least amount of friction.
ACTIVITY	Students will divide into groups for the project of building some type of vehicle. The primary purpose of the vehicle is to travel the greatest distance given a certain force. Weight should not be over 500 grams and size not more than 25cm cubed. The vehicle must be able to carry a 100-gram payload during its test run. Materials are optional, wheels can be used but are not required. Gravity will provide a constant force for each vehicle. A ramp which is 30 cm high and one meter long will be provided leading to a flat runout area. Students will review areas in which friction occurs. These may include contact with the surface, two areas rubbing, wheels that are not aligned, air flow. Students will explore and decide criteria for judging and evaluating their vehicles. Some options may include creativity, use of unusual power sources, straightest run, etc. Students will judge and evaluate the vehicles themselves according to the determined criteria.
CLOSURE	From what we've learned about friction, what could we predict about vehicles in the future? *William's Strategies: evaluative situations. See Appendix A.*
SPECIAL NOTE	Technology may be used to compare vehicles for other factors: cost, maximum payload/vehicle weight. This information could be put on an electronic database for comparison and analysis. A spreadsheet computer program which calculates the amount of friction based on variations in design could be used in a trial and error process before actual construction of vehicles.

TOPOGRAPHIC MAP LESSON PLAN

CURRICULUM AREA Science/Map Reading

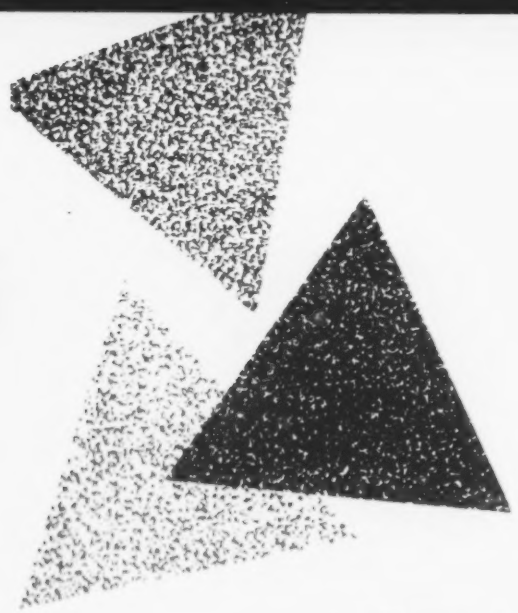
GRADE LEVEL(S) Grades 8-12

INTRODUCTION How is a map like the circulatory system? What skills are necessary for creating maps? *Williams' Strategies: analogies; study of creative people and processes. See Appendix A.*

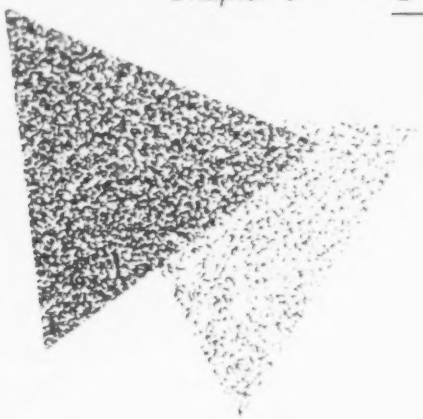
OBJECTIVE Students will recognize and interpret topographic map symbols. When given a description of a flight path of an airplane they will construct the probable flight path and determine its final location.

ACTIVITY Students may choose to work individually or in groups as they examine and become familiar with the area depicted on a topographic map. They will be in charge of a simulated search and rescue operation and will monitor emergency radio. Students will listen to the following message which has been recorded on a tape: "MAYDAY! MAYDAY! MAYDAY! This is 1234B, a single engine Cessna. OUT OF CONTROL! (static-30 second time lapse) 1234B on guard channel (emergency channel) regained control at 2000 feet, engine faltering. Unsure of position (static) I see three small lakes to the west. Losing altitude. Just passed over a crossroad with a few buildings. (static) Engine stopped, no good landing area (static). Passed over ridge and turned left down valley (static) over lake with a dam (static). Unable to maintain altitude, will try (static)..." Students will activate local rescue team and notify other authorities. They will decide where to begin their search. (Latitude and Longitude). Rationale and how to get to this area on the ground will be determined. Students will complete the story using an appropriate product of their choice, skit, paper, television news item, etc. They will include how survivors were found, how the topographical map aided the rescue, what obstacles were faced, etc.

CLOSURE Predict what features maps of the future might include. How can we become lost using a map? *Williams' Strategies: evaluative situations; provocative questions. See Appendix A.*



Chapter 3 SOCIAL STUDIES



LESSON PLANS

- Comparing Presidents
- Local History Data Base
- Teenage Spending
- Budgeting Lesson
- Labor Management Relations

COMPARING PRESIDENTS LESSON PLAN

CURRICULUM AREA Political Science

GRADE LEVEL(S) Grades 7-12

INTRODUCTION How is a president like a candle? In order to see the whole picture, what should we ask about the image of a president? *Williams' Strategies: analogies; discrepancies. See Appendix A.*

OBJECTIVE Students will develop an understanding of the characteristics that determine a weak or strong president.

ACTIVITY Students will use *MECC Dataquest: The Presidents* (see References). First, the class will brainstorm and list characteristics of a strong president. Students are provided with a rating list of strong/weak presidents. A rating list might be obtained by using online databases such as "Datatimes," " Compuserve," " Dialog" (see References). Students will research in *MECC Dataquest*, *CD/ROMGrolier's Electronic Encyclopedia*, the *Video Encyclopedia of the 20th Century*, or any other available resource, the characteristics of the strongest and the weakest presidents from the rating list. Students will analyze those characteristics and determine which are most prevalent among the two groups of presidents. Clips of presidential speeches from the *Video Encyclopedia* can be viewed and discussed as far as noted characteristics are concerned. A viewing of the Nixon/Kennedy television debates could lead to a discussion on what effect television and other media have on a president's or candidate's image concerning strong and weak characteristics.

CLOSURE How could a candidate for president use the characteristics of a previous "good president" to plan an effective campaign? What characteristics would a president demonstrate if the nation were experiencing ideal circumstances in all areas represented by cabinet positions? *Williams' Strategies: examples of change; tolerance for ambiguity. See Appendix A.*

LOCAL HISTORY DATABASE LESSON PLAN

CURRICULUM AREA Local History

GRADE LEVEL(S) Grades 9-12

INTRODUCTION How many ways could we find to organize data about the history in our area? How can we predict the future by studying the past? *Williams' Strategies: organized random search; provocative question. See Appendix A.*

OBJECTIVE Students will research their local history and how it was affected by national and international events and be able to use a computer database to manipulate and analyze data gathered in order to bring about new insights on history.

ACTIVITY Students will listen to presentation by teacher or media specialist on database as a structure for researching. It is important for all students to research the same type of information, but choices may be made as to what preselected categories for the database will be used and they must also agree on identical terms to use when putting data into the database so class data can be sorted and searched. Students will divide into small groups. Each group will be responsible for determining area of study and gathering information about a specific category of local history, for example, historical buildings, key people or families, industries, population trends, factors affecting local economy, schools, etc. Information will then be entered into an already prepared electronic database. Students will generate a list of questions to answer based on manipulation and analysis of the data. Some of the questions should relate the local history to national and international events so students can draw conclusions as to cause and effect of one event to another. These national and international events may be researched on an online database.

CLOSURE How could the steps in our study of local history be used to study and address the problems of crime in our area? Using the medium of your choice, illustrate the history of our area. *Williams' Strategies: study of creative people and process; visualization skill. See Appendix A.*

SPECIAL NOTES

Teacher should be very involved in helping students determine relevant data. There are several database computer programs (see References) available which would be of help in determining categories for research and for collecting data, depending on what information is desired.

TEENAGE SPENDING LESSON PLAN

CURRICULUM AREA Economics

GRADE LEVEL(S) Grades 9-12

INTRODUCTION What would our economy be like if we had ideal circumstances? How could the steps in problem solving be used to study the economy? *Williams' Strategies: tolerance for ambiguity; study of creative people and processes. See Appendix A.*

OBJECTIVE The students will gain an understanding of the power that their spending has on the local economy.

ACTIVITY Students will select an area in which there is a considerable amount of teenage spending school sports, cars, entertainment, graduation costs, food, movies, etc. Students will decide and turn in to the teacher a statement of what they hope to find out about this area of study (the amount of teenage spending in their area and the impact on the local economy). Students will identify all expenditures within the area of study, e.g., cars: tires, gas, license, repair, insurance, etc. Data will be entered on an electronic spreadsheet for easier analysis and interpretation (charts and graphs will be developed by using a computer graphing program or a "report" program that works with the spreadsheet). Students will display their graphs in the classroom or elsewhere in the school. The students will then prepare a written and/or oral report for the class to discuss. The class will compile all the information gathered to assess the impact of all teenage spending in a particular area. Students will discuss what would happen to the area if teenagers quit spending in one or more areas.

CLOSURE From what we have discussed about teenage spending patterns, what could we predict about the spending patterns of other age groups in the future? In what ways might we collect more data on people's spending habits (evaluative situations; skills of search)?

BUDGETING
LESSON PLAN

CURRICULUM AREA Economics

GRADE LEVEL(S) Grades 9-12

INTRODUCTION Regarding money, how can a little be a lot? What traits or skills are necessary for a person to be able to live within a budget? *Williams' Strategies: paradoxes; study of creative people and processes. See Appendix A.*

OBJECTIVE Students will use a computer spreadsheet program to develop their own budget.

ACTIVITY Students will select or draw a budget template to work with. Depending on their base income, they then research and select various options for living expenses (type of car, rent or buy a house, personal expenses, luxuries, etc.). Then they enter the costs of their selections into the template. Students should be able to evaluate their selections according to their incomes. Students will select some "chance cards" which contain either positive or negative influences on budgets. Students will draw cards sometime during this activity and alter their budgets accordingly (example: win $200 at pull tabs, car totaled in accident, etc.). Students will discuss how realistic their budget selections are and what quality of life they could expect based on their decisions. Because their selections will also reflect their values, discussion may also include what students value and why. The computer capabilities allow students to manipulate and/or change their decisions easily.

Time can be used as a budget factor rather than money for younger students or if not every student has an income. Students will keep a daily record of their time usage for a period of one week. Students will categorize their fixed and variable time expenses. Average time expenses per day are then calculated. A comparison is made with either a teacher-generated estimated budget or the class's average budget.

SAMPLE

school	sleep	eat	study	recreation
6	8	1	2	3

Students examine their own budgets and determine if there are ways to improve their use of time.

CLOSURE

How might the idea of budgeting change if we knew that a recession was imminent? How would you do budgeting without numbers? *Williams' Strategies: evaluative situations; tolerance for ambiguity. See Appendix A.*

SPECIAL NOTES

Students will need an introduction to Appleworks spreadsheet or a similar spreadsheet. Before this activity, one budget template with fields for variable expenses and incomes needs to be constructed. The template should then be copied so there are enough for each computer. The individual templates should have an income amount (different for each) entered onto the spreadsheet, plus some fixed-expense items such as medical insurance, utilities, etc., for a 12-month period.

LABOR MANAGEMENT RELATIONS LESSON PLAN

CURRICULUM AREA Economics

GRADE LEVEL(S) Grades 11-12

INTRODUCTION If you knew that a strike was going to occur in a company you owned, how might you change your actions or decisions? What else might you need to know to answer that question? When is a labor union not united? *Williams' Strategies: evaluative situations discrepancies; paradoxes. See Appendix A.*

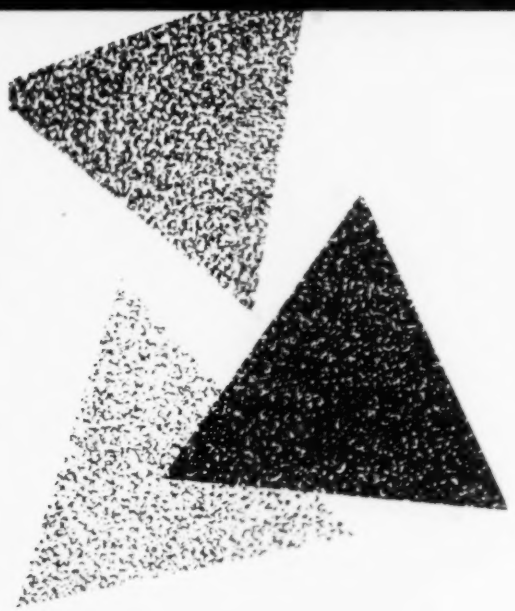
OBJECTIVE Students will role play the process by which labor and management have resolved their differences.

ACTIVITY Students will divide into labor and management groups of a fictitious company. Each group receives information on the role they will play and any pertinent financial information of the company and/or the workers from a computer simulation program. Several are available on the market. Using this information, the labor group comes up with a proposal for changes they would like to see in their new contract. Management must respond to the proposal with a counterproposal or acceptance. Students go through the negotiations process to arrive at a mutually acceptable contract. It is important to keep the negotiations as realistic as possible (closed meetings, union members and non-members, a variety of roles to play—workers and management—with a variety of opinions and reasons for that opinion, etc.)

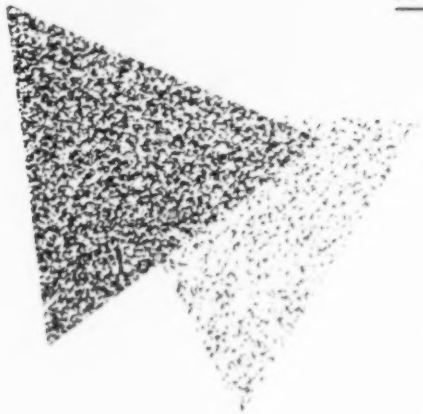
CLOSURE What recommendations could you make to someone involved in labor/management relations? Where have mistakes in labor/management relations led to progress? *Williams' Strategies: organized random search; adjustment to development. See Appendix A.*

SPECIAL NOTES A special labor management relations packet explaining the whole simulation is available from the Brainerd, Minnesota public schools (see References). Although the simulation can be done without this packet, much teacher preparation time will be saved by sending for the information.

There are several computer programs on the market which have a similar simulation all worked out. However, using only the computer simulation may take away some of the needed reality. It is advisable to use the computer simulation for help in describing roles, figuring cost of raises, etc., but not to rely totally on it.



APPENDICES



•A - Williams Model for Cognitive Interaction

•B - Databases

APPENDIX A

WILLIAMS MODEL FOR COGNITIVE-AFFECTIVE INTERACTION

The purpose of Williams Model for Cognitive-Affective Interaction is to help teachers explore ways to set up and conduct educational experiences in the classroom. Students are given opportunities to use and practice strategies and behaviors which develop creative and productive thinking while learning a unit of subject matter. The model is intended to increase student motivation, develop divergent mental skills which make students more creative and to expand the repertoire of teachers' teaching strategies.

Williams Model for Cognitive-Affective Interaction is a "morphological" (interrelated) model that has as its major assumption that all components are interrelated parts of a whole and not built on a taxonomy or hierarchy. The model integrates student behaviors, content, and teaching strategies. It is a diagnostic prescriptive model for teachers that has three dimensions: six basic subjects of a school curriculum, eighteen strategies, and eight divergent pupil processes defined by Guilford and others.

The six basic subjects in the Williams model are: art, music, science, social studies, arithmetic, and language. In this model subject matter is seen as a means to an end by providing content about which to think and feel.

The eight divergent pupil behaviors include four defined by Guilford and Meeker and four evident in studies of the disposition and temperament of creative people. The eight divergent pupil behaviors and brief descriptions as described in Chapter 15 of *Systems and Models for Developing Programs for the Gifted and Talented* (Williams 1986) are:

COGNITIVE-INTELLECTUAL

•Fluent thinking - Generation of quality, flow of thought, number of relevant responses.

•Flexible thinking - Variety of ideas, ability to shift categories, detours in directions of thought.

•Original thinking - Unusual response, clever ideas, production away from the obvious.

•Elaborative thinking - Embellishing upon an idea, embroider upon a simple idea or response to make it more elegant, stretch or expand upon things or ideas.

AFFECTIVE-TEMPERAMENT

•Risk-taking - Willingness to expose oneself to failure or criticism, take a guess, function under conditions devoid of structure, defend own ideas.

•Complexity - The ability to seek many alternatives, see gaps between how things are and how they could be, bring order out of chaos, delve into intricate problems or ideas.

•Curiosity - The capacity to be inquisitive and wonder, toy with an idea, be open to puzzling situations, ponder the mystery of things, follow a particular hunch just to see what will happen.

•Imagination - The power to visualize and build mental images, dream about things that have never happened, feel intuitively, reach beyond sensual real boundaries.

The eighteen strategies listed in the Williams model are: paradoxes, attributes, analogies, discrepancies, provocative questions, examples of habit, organized random search, skills of search, tolerance for ambiguity, intuitive expression, adjustment to development, study of creative people, evaluation situations, creative reading skills, creative listening skills, creative writing skills, and visualization skills. According to Williams, "strategies have been devised empirically from many studies of how all good teachers behave and operate implicitly in the classroom." (Williams 1986).

The following are brief explanation by Williams of the eighteen strategies.

1. Paradoxes - Common notion not necessarily true in fact: self-contradictory statement or observation.

2. Attributes - Inherent properties, conventional symbols or identities, ascribing qualities.

3. Analogies - Situations of likeness, similarities between things, comparing one thing to another.

4. Discrepancies - Gaps or limitations in knowledge, missing links in information, what is not known.

5. Provocative Questions - Inquiry to bring forth meaning, incite knowledge exploration, summons to discovering new knowledge.

6. Examples of Change - Demonstrate the dynamics of things, provide opportunities for making alterations, modifications, or substitutions.

7. Examples of Habit - Effects of habit-bound thinking, build sensitivity against rigidity in ideas and retried ways.

8. Organized Random Search - Use a familiar structure to go at random to build another structure, an example from which new approaches occur.

9. Skills of Search - Search for ways something has been done before —historical search, search for current status of something, descriptive search, set up an experimental situation and search for what happens, experimental research

10. Tolerance for Ambiguity - Provide situations which puzzle, intrigue or challenge thinking, pose open-ended situations which do not force closure.

11. Intuitive Expression - Feeling about things through all senses, skill of expressing emotion, being sensitive to inward hunches or nudges.

12. Adjustment to Development - Learning from mistakes or failures, develop from rather than adjust to something, develop many options or possibilities.

13. Study Creative People and Process - Analyze traits or eminently creative people. study processes which lead to problem solving, invention, incubation, and insight.

14. Evaluate Situations - Decide upon possibilities by their consequences and implications, check or verify ideas and guesses against the facts.

15. Creative Reading Skills - Develop a mind set for using information that is read, learn the skill of generating ideas by reading.

16. Creative Listening Skill - Learning the skill of generation ideas by listening, listen for information allowing one thing to lead to another.

17. Creative Writing Skill - Learning the skill of communicating ideas in writing, learn the skill of generating ideas through writing.

18. Visualization Skill - Express ideas in visual forms, illustrate thoughts and feelings, describe experiences through illustrations.

Educators interested in more information about the Williams model are encouraged to read the appropriate chapters in *Teaching Models in Education for the Gifted* (Maker 1982) and *Systems and Models for Developing Programs for the Gifted and Talented* (Williams 1986).

APPENDIX B

DATABASES

Databases are sophisticated electronic filing systems that make use of the power and ability that computers have to read and sort information very fast. These computer capabilities allow researchers to cover vast amounts of information and include only those information items predetermined as relevant to a particular search. A database is made up of numerous information units called records. Records can vary in size and composition and can range from text articles to numerical charts. The records can be searched by fields or keywords.

Fields are information categorized by topics such as author(s), subject, titles, date of publication, publisher, cost, geographic location, etc. The total related information aggregated by related fields is called a file. The power of an electronic database is due to the computer's ability to search and sort information using numerous fields simultaneously through using text search, combining key terms using Boolean logic connectors ("and," "or, " "not"), and statistical analysis. Some databases have abilities to develop graphing and other display formats that inform readers through visually appealing presentations of information.

There are many skills that can be taught through use of databases. Some of the most significant are: accessing information, organizing information, storing information in easy accessible formats, determining what information elements are the same or different, what relationships exist among attributes and information elements, how to create logical and efficient research strategies, how to make and test hypotheses and conclusions, how to structure Boolean and other logic expressions and how to communicate conclusions reached when working with databases.

Databases can be created by users or purchased from commercial vendors either on disk storage devices or online access time can be purchased and used through connections with a modem. Educators interested in creating their own databases are encouraged to read several articles on this topic in *The Computing Teacher* (November 1984). An excellent source for information about online resources and how to use them is the publication *Online for Information* (1989) published by the Minnesota Department of Education, Instructional Design Section.

RESOURCES

Acid Rain Foundation. 1037 Bidwell, West St. Paul, MN 55118.

Labor management relations packet. Available from Brainerd Senior High School, 702 South Fifth Street, Brainerd, Minnesota 56401.

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